

into counterproductive attacks on scientific 'elitism', particularly during the Cultural Revolution of the late 1960s and early 1970s.

As a scientific discipline with profound implications for the origin and diversification of humans, palaeoanthropology has inevitably contributed to shaping human identity. In this regard, Schmalzer makes a strong case for the key role of palaeoanthropology in the intellectual history of modern China. Her book draws on a wide range of academic and popular sources to show how scientific ideas about human evolution have influenced political and ideological currents in Chinese society, and

how ideology has influenced — most scientists would probably say distorted — the scientific interpretations in return.

*The People's Peking Man* is not a primer on the fossil record of Chinese hominids or the latest interpretations of human evolution. In one or two places, Schmalzer even seems to flirt with postmodernist scepticism about the empirical validity of science, asserting that "the boundary between science and non-science is blurry, contested and constructed". However, Schmalzer's book finds a great deal to say about issues as diverse as the historical significance of Chinese fossil humans, the search for yetis (called *yeren*,

or 'wild people' in China), changing concepts of human identity, and the conflict between top-down science dissemination and bottom-up mass participation in Chinese science. She also explores other diverse issues that include the connections among science, politics, religion and culture, and the relationship between professional scientists and the general public. Schmalzer presents all these topics in a lively, accessible and thought-provoking way. ■

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## Thinking outside the box

### Supersizing the Mind: Embodiment, Action, and Cognitive Extension

by Andy Clark

Oxford University Press: 2008. 320 pp. \$35

In *Supersizing the Mind*, philosopher Andy Clark makes the compelling argument that the mind extends beyond the body to include the tools, symbols and other artefacts we deploy to engage the world. According to Clark and other proponents of the 'extended mind' hypothesis, the laptop on which I am writing this review is coupled to my brain and has become part of my mind. Manipulating sentences on the screen can prompt new insights and new ways of conveying ideas, a reiterative cognitive process that would be difficult to achieve without such a tool. The same argument applies to my BlackBerry, to the white board in my office, and even to the conversations I might have with my colleagues. Cognition, Clark argues, is not 'brain-bound' but a dynamic interaction between the neural circuits inside our skulls, our bodies and the objects and events in the outside world.

For researchers who study the control of movement, this idea has resonance. Perhaps it is for this reason that Clark begins by explaining how the production of fluid movements, such as walking or running, is a joint product of control systems in the brain and the dynamics of the limbs — the elasticity, viscosity and mass of the muscles, the connection of tendons to the joints, and the physical contact between the limbs and the environment. Clark uses this familiar example as an entry point

to the more contentious idea that cognitive activity similarly extends beyond the brain, skull and body to the external world.

The book develops the seminal ideas set out in a 1998 paper, 'The Extended Mind', co-authored by Clark and fellow philosopher David Chalmers. Over the past ten years, that paper has emerged as the key reference among philosophers, neuroscientists and psychologists who are interested in embodied cognition. The paper has naturally engendered criticism, particularly from those who see the mind and cognitive activity as brain-bound. In *Supersizing the Mind*, for which Chalmers has written a thoughtful and challenging foreword, Clark deals directly with many of these critiques, and in doing so, strengthens the major tenets of the extended mind hypothesis while offering a more nuanced discussion of the implications of this idea.

Clark explores in detail the consequences of embodied and extended cognition for our conscious perception of the world. He acknowledges that the "intimacy of brain, body, world,

and action" must have implications for our perceptual experience, but ultimately rejects the idea of enactive perception championed by philosopher Alva Noë, in which our experience is seen as nothing more than the sensorimotor routines that we use to interact with the world. For Clark, perception is shaped by the way in which we explore this world. But at the same time, he argues, our conscious experience of objects and events is not bound to the details of the sensorimotor routines that mediate that exploration. These routines, he suggests, are controlled by encapsulated systems with operating characteristics that are not privy to conscious, or even unconscious, scrutiny and whose activity is removed from the information they convey. In rejecting Noë's sensorimotor model, Clark argues that conscious perception does not depend on a "common sensorimotor currency" but arises from a subtle interplay between brain, body and environment, "replete with special-purpose streaming and with multiple, quasi-independent forms of internal, and external, representation and processing".

*Supersizing the Mind* is a treat to read. It is brimming with remarkable ideas, novel insights and amusing language. But it also challenges those of us who study cognitive processes. If Clark is right, and I think he is, then simply studying what goes on in the brain will tell us only part of what happens as cognitive activity unfolds. To capture the richness of thought, we have to step outside the box and embrace the world beyond the skull. ■

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Does the mind extend past the brain and body to our external interactions?